

PATENT SPECIFICATION

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(54) A METHOD AND APPARATUS FOR TRANSPORTING A VARIABLE NUMBER OF ARTICLES FOR STACKING

(71) We, MARCO GIAVAZZI, of Via Chopin 89, Milan, Italy, and ANGELO FRANCO GIAVAZZI, of Via Curiel 22, Milan, Italy, both Italian citizens, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to a method of transporting a variable number of articles for stacking and to an apparatus for carrying out the method. The articles may be newspapers or magazines which, after stacking, may be packaged. The packages are usually formed manually, by a large number of workers, which is obviously highly expensive. Above all in the case of newspapers, the packaging of which is to be made within unusually short times, such operation involves a remarkable charge which adds itself to prime costs of articles.

In the case of newspapers, there is already known a machine by which newspaper piles are formed, capable of counting the newspapers at the outlet of a rotary press where they are in a stepwise overlapped condition, and of forming packages with the thus counted and withdrawn newspapers. However, the flexibility of such machine is poor, since it is only able to operate on the basis of the preset programming, and any change interfering in said programming - as often occurs - involves the need of a time-consuming re-programming of the machine. Moreover the machine, which is particularly complex and expensive, can be utilized only for forming packages containing a rather high number of printed matter, e.g. 16-20 or more items in each package, since otherwise its operating speed would be excessively reduced, and inadmissible stoppages of the rotary press, located directly upstream and in cascade, have to be taken into account.

The problem of inexpensively mechanizing the stated operations, so as to ensure a satisfactory operating flexibility, both as regards the number of piled items, and as regards the operating speed, has not yet been practically solved, neither in the field of production of printed matter, nor in other fields of activity.

This invention seeks to provide a method of transporting a variable number of articles for stacking, and an apparatus for carrying out the method which, in a preferred embodiment, solve this problem.

According to one aspect of the invention there is provided a method of transporting a variable number of articles for stacking, comprising feeding each article to a compartment in an endless conveyor magazine having opposed feeding and withdrawal zones, the compartments of which are successively located at a feed position in said feeding zone to receive an article so fed, arranging for a preselected but variable number of articles to be simultaneously withdrawn at a withdrawal position in said withdrawal zone of the endless conveyor magazine to form a stack, the location of the positions at which articles enter and leave said compartments enabling the endless conveyor magazine to be adapted to the respective rates of feeding and withdrawal of articles by controlled displacement of the endless conveyor magazine relative to such locations in directions parallel to the runs of the conveyor for feeding and withdrawal, this displacement extending or reducing the extent of said magazine between the feeding and withdrawal positions.

According to another aspect of the invention there is provided an apparatus for carrying out the method of the preceding paragraph, comprising an endless circulating conveyor magazine having opposed feeding and withdrawal runs and having a plurality of compartments in which at least one article

to be stacked may be inserted, means arranged at a given level and at a feeding position for feeding articles to the feeding run to successively feed the articles to said compartments, means arranged at a given level and at a withdrawal position for receiving articles withdrawn from said magazine along the withdrawal run in a withdrawal zone, means arranged to withdraw a said preselected number of articles and means by which the operative extent of the magazine is adapted to feeding and withdrawal conditions by displacing the endless conveyor magazine assembly relative to said feeding and withdrawal means in a direction parallel to the feeding and withdrawal runs to correspondingly change the extent of the magazine which extends between the feeding and withdrawal positions.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings in which:-

Figure 1 is a diagrammatic side view of an apparatus for packing a variable number of articles; and

Figures 2, 3 and 4 diagrammatically show the apparatus of Figure 1, in its different operating conditions.

Referring now to the drawing, an apparatus will now be described which is particularly suitable for the formation of piles or packages of printed matter, such as newspapers, coming directly from a rotary press or from a compensating magazine and possibly already suitably folded. Each item 10 of printed matter is fed by a conventional conveyor, e.g. by a double conveyor band 12, to a magazine 14 having a plurality of housings 16 in each of which one or possibly more than one item 10 can be accommodated.

The magazine 14 comprises an endless chain 18 preferably a pair of endless chains located in parallel planes, bearing supports 20, by which the single housings 16 are defined. The chains extend around a pair of transmission wheels, loosely fitted on stub shafts 26 and 28 which are mutually connected by rigid cross-members 30. The magazine 14 is moreover fitted so as to be freely movable in either direction, parallel to each of its main section, as shown by the double arrow, possibly under the action of a counterweight 32, acting thereon by a cable 34 and transmission pulleys 36, 38.

As shown in Figure 1, the items 10 of printed matter are fed to one of the main sections of the magazine 14 in a fixed point, i.e. a point which is not shifted along with the magazine in the direction X. Fitted in front of the other main section of magazine are means for the withdrawal of the items 10 of printed matter, comprising a pusher 40, acting between the chains 18, for the ejection

of a given number of items 10 of printer matter out of their housings 16. A plurality of housings, extending between a delimitation mark 42 and a collecting device 44 can be acted upon by the pusher 40. The collecting device may be in the form of a conveyor band, whereon the items 10 of printed matter are piled or stacked. The number of housings that extend between the mark 42 and the conveyor 44, i.e. those which are acted upon by the pusher 40, is equal to the maximum number of items 10 of printed matter which can be stacked to form a package, by the apparatus as shown, provided that no housing contains more than one item 10.

For driving the conveyor magazine 14, two pinions or control means 46 and 48 are provided. Such pinions respectively act on the feeding section and on the withdrawal section of the conveyor magazine 14, independently from one another, according to instantaneous conditions of feeding and of withdrawal. The compensation of momentary differences between the travels of both conveyor sections is made by varying the length of conveyor portion that extends between the feeding position and the withdrawal position. Obviously by the driving means 46 and 48, shiftings of related sections of conveyor 14 are caused, which should be equal to one indexing of the housings 16, or to a multiple thereof.

As stated above, the apparatus is initially fed by the feeder 12, while simultaneously driving the magazine by the pinions 46 and 48 until the first item of printed matter is brought in front of the mark 42, as shown in Figure 2. Then, said feeding is continued, by indexing each time the pinion 46, whilst the pinion 48 is kept still, which results in a shifting (upwardly as shown in the Figures) of the magazine 14 with an increase in the useful length of the magazine, between the feeding and withdrawal positions, attaining e.g. the position as shown in Figure 3.

From this point onward, the normal operation of the apparatus for the formation of piles can be started. In the course of such operation, the feeding continues as described hereinbefore, while the withdrawal is performed by controlling the pinion 48 in such a manner as to cause the withdrawal section to be advanced beyond the line 42 for a number of indexings equal each time to the required number of items of printed matter to be piled, whereupon the pusher 40 is operated, by which the pile (consisting of items 50 in Figure 4), is placed on the conveyor 44. The pusher 40 then returns to its inoperative position as shown in Figures 1 to 3 inclusive. Obviously, the indexing of the driving pinion 48 may be made either manually or by a suitable programmed control, and the average travelling

speed, imparted to the conveyor withdrawal section by the pinion 48, should be proportioned, and preferably be equal to the average travelling speed, as imparted to the conveyor feeding section by the pinion 46. However the possible momentary differences between said speeds can be compensated for, by the compensating effect secured by the possibility of shifting the magazine assembly, by which the length of useful portion thereof, extending between the feeding and the withdrawal positions, can be modified.

The apparatus may be fitted with different servo-mechanisms and follow-up controls, e.g. for allowing the indexing of the pinion 46 to enable an item of printed matter to be correctly introduced into a housing, as well as for stopping the pinion 46 at the end of the useful stroke of the magazine assembly in one direction (upwardly in the Figures) and moreover for discontinuing the indexing of the pinion 48 when the required number of items of printed matter to be stacked is not available above the reference mark 42.

The apparatus may be also fitted with a plate for supporting the top of the pile located in a vertically intermediate position between the reference mark 42 and the conveyor 44. The plate may be used for transferring the pile to a known so-called pile turning device which is used to equalize the edges of the items in the pile prior to the final formation of the package.

WHAT WE CLAIM IS:-

1. A method of transporting a variable number of articles for stacking comprising successively feeding each article to a compartment in an endless conveyor magazine having opposed feeding and withdrawal zones, the compartments of which are successively located at a feeding position in said feeding zone to receive an article so fed, arranging for a preselected but variable number of articles to be simultaneously withdrawn at a withdrawal position in said withdrawal zone of the endless conveyor magazine to form a stack, the location of the positions at which articles enter and leave said compartments enabling the endless conveyor magazine to be adapted to the respective rates of feeding and withdrawal of articles by controlled displacement of the endless conveyor magazine relative to such locations in directions parallel to the runs of the conveyor for feeding and withdrawal, this displacement extending or reducing the extent of said magazine between the feeding and withdrawal positions.

2. A method according to claim 1, wherein the displacement of the feeding run and of the withdrawal run of said conveyor magazine is respectively actuated by independent drives following changes in conditions of feeding or withdrawal, the momentary differences between the rate of displacement of said two runs being compensated by changes in said extent of the magazine between said positions.

3. A method according to claim 1 or claim 2, comprising providing a withdrawal zone capable of including the maximum number of articles intended to be stacked and preselecting the amplitude of the displacement of the withdrawal run of said magazine in such a manner that a pre-set variable number of compartments each carrying an article to be stacked is located in the withdrawal zone prior to withdrawal of articles from said compartments.

4. A method according to claim 3, wherein the total number of the compartments of the withdrawal zone is equal to the number of articles in a stack formed after a withdrawal operation there being one article in each compartment.

5. A method according to claim 3 or claim 4, wherein the articles are superimposed in single compartments of the withdrawal zone, the withdrawal being performed by simultaneously ejecting these articles from their compartments.

6. Apparatus for carrying out the method according to any one of the preceding claims, comprising an endless, circulating conveyor magazine having opposed feeding and withdrawal runs and having a plurality of compartments in which at least one article to be stacked may be inserted, means arranged at a given level and at a feeding position for feeding articles to the feeding run to successively feed the articles to said compartments, means arranged at a given level and at a withdrawal position for receiving articles withdrawn from said magazine along the withdrawal run in a withdrawal zone, means arranged to withdraw a said preselected number of articles and means by which the operative extent of the magazine is adapted to feeding and withdrawal conditions by displacing the endless conveyor magazine assembly relative to said feeding and withdrawal means in a direction parallel to the feeding and withdrawal runs to correspondingly change the extent of the magazine which extends between the feeding and withdrawal positions.

7. Apparatus according to claim 6, wherein the feeding run is driven by a drive means controlled according to the feeding rate of articles to the magazine, while the withdrawal run of the magazine is driven by a separate and independent drive means controlled according to the rate of withdrawal of articles.

8. Apparatus according to claim 7, wherein control devices are provided for the travel of both magazine runs by which control devices a respective said driving means is stopped when a respective one or other

end-stroke positions of the magazine is reached.

- 5 9. Apparatus according to claim 7 or 8, wherein a displacement of the magazine runs equal to the pitch or depth of one or more compartments is effected stepwise by one of said drive means.

- 10 10. Apparatus according to any one of claims 7 to 9, wherein the average speeds of the drive means for the feeding and withdrawal runs of the magazine are equal.

- 15 11. Apparatus according to any one of claims 7 to 10, wherein said withdrawal means comprises at least one ejector for ejecting the articles present in a plurality of compartments and equal to the number of articles selected for a stack, and wherein the withdrawal run of the magazine is advanced stepwise each time by a distance sufficient to locate the required number of compartments containing the articles for a stack in front of said ejector.

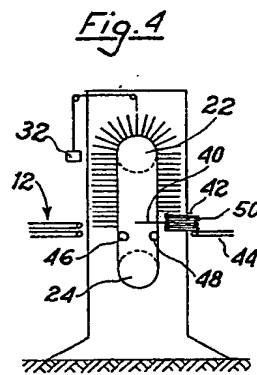
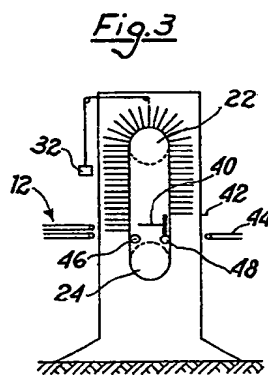
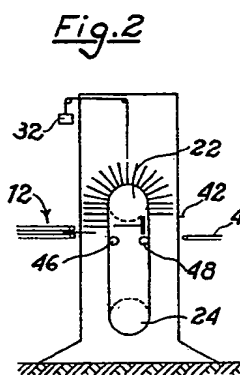
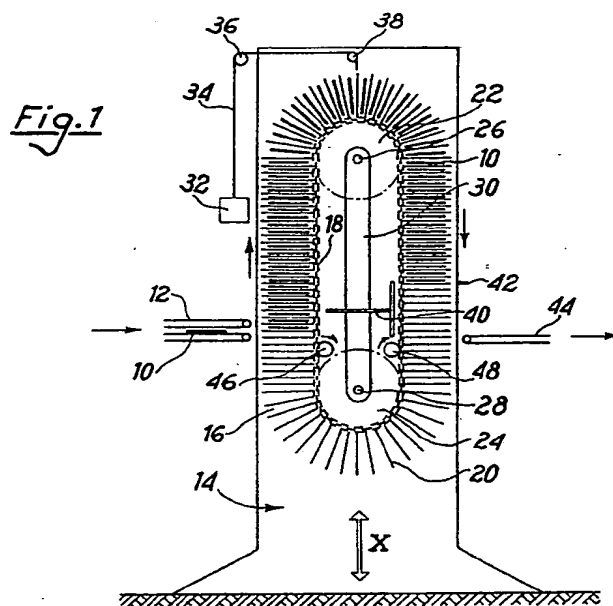
- 20 12. Apparatus according to claim 11,

wherein said articles arranged superposed in their compartments are located in front of the ejector at the withdrawal position where these articles are to be stacked, said ejector being operated to eject the articles from the compartments to locate them on one or more supports on which the stack is formed.

13. A method of transporting a variable number of articles for stacking, substantially as hereinbefore described with reference to the accompanying drawing.

14. Apparatus for transporting a variable number of articles for stacking, arranged, constructed and adapted to operate substantially as hereinbefore described with reference to the accompanying drawing.

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